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Milazzo

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[54] **MULTI-STAGE MATCH TRIGGER ASSEMBLY FOR USE WITH SEMI-AUTOMATIC WEAPONS**

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[21] Appl. No.: **575,469**

[22] Filed: **Dec. 20, 1995**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 299,854, Sep. 1, 1994, Pat. No. 5,501,134.

[51] **Int. Cl.**[6] **F41A 17/82**

[52] **U.S. Cl.** **42/70.08**; 42/70.06; 42/69.03; 89/148

[58] **Field of Search** 42/69.03, 70.09, 42/70.06; 89/148, 154

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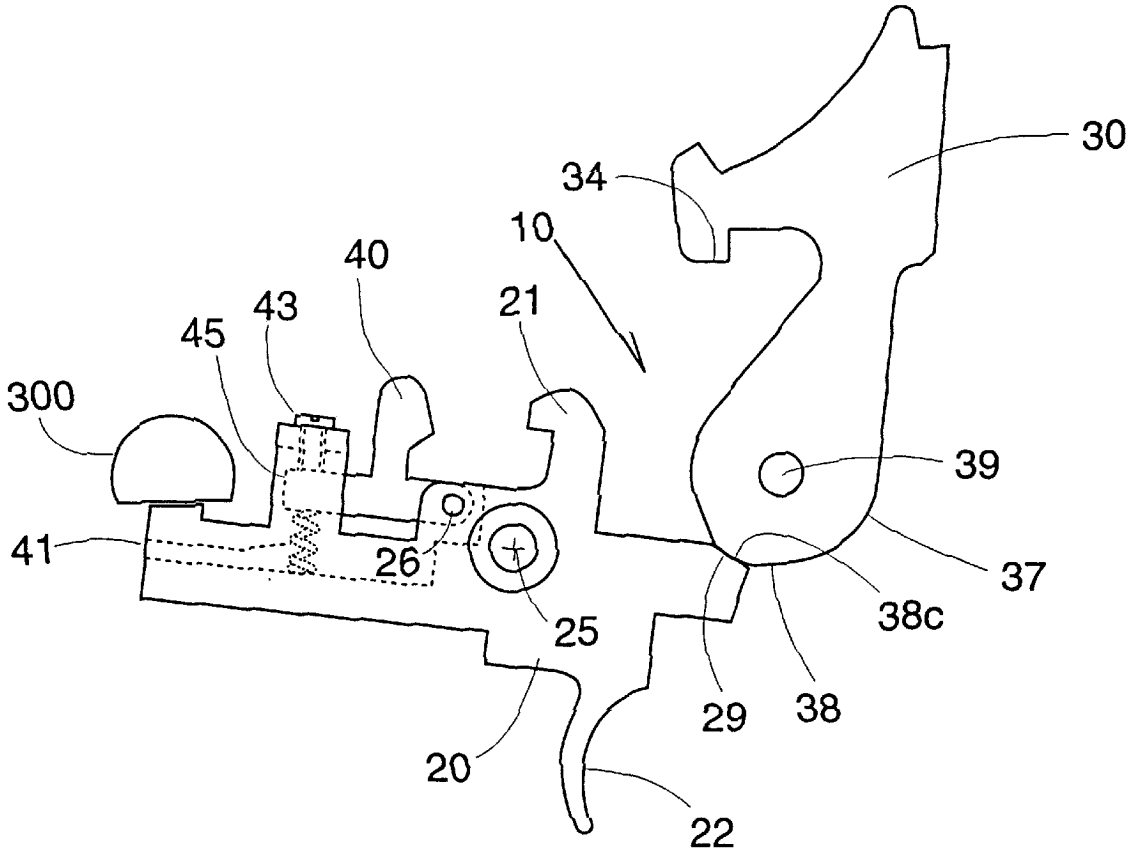
Attorney, Agent, or Firm—Ryan Kromholz & Manion, S.C.

[57] **ABSTRACT**

A multi-stage trigger assembly for use by a shooter of a firearm. Specifically an AR-15 or M-16 although other types of firearms could be used. The invention comprises a trigger, a disconnector, disconnector spring, and a hammer. The trigger and the hammer each include a respective engagement means for engaging each other so that the hammer is held in a cocked position by the trigger before the trigger is pulled. The hammer further includes a contact means for contacting the disconnector so that when the trigger is first pulled (the first stage) the contact means contacts the disconnector at a predetermined time and increases the pressure required to pull the trigger completely and disengage the engagement means of the hammer and the trigger (the second stage). Additionally, the disconnector is spring loaded by the disconnector spring and pivotally connected to the trigger. This is so that the disconnector may interact with the hammer, which further includes a contact means for contacting the disconnector so that when the trigger is first pulled (the first stage) the contact means perceptibly contacts a cam like surface on the disconnector at a predetermined time where minimal engagement between the engagement means of the hammer and trigger is reached. The disconnector spring increases the pressure required to pull the trigger completely and disengage the engagement means of the hammer and the trigger (the second stage). This stop, or noticeable contact indicates to the shooter that the limited minimal engagement of the second stage has been reached.

12 Claims, 11 Drawing Sheets



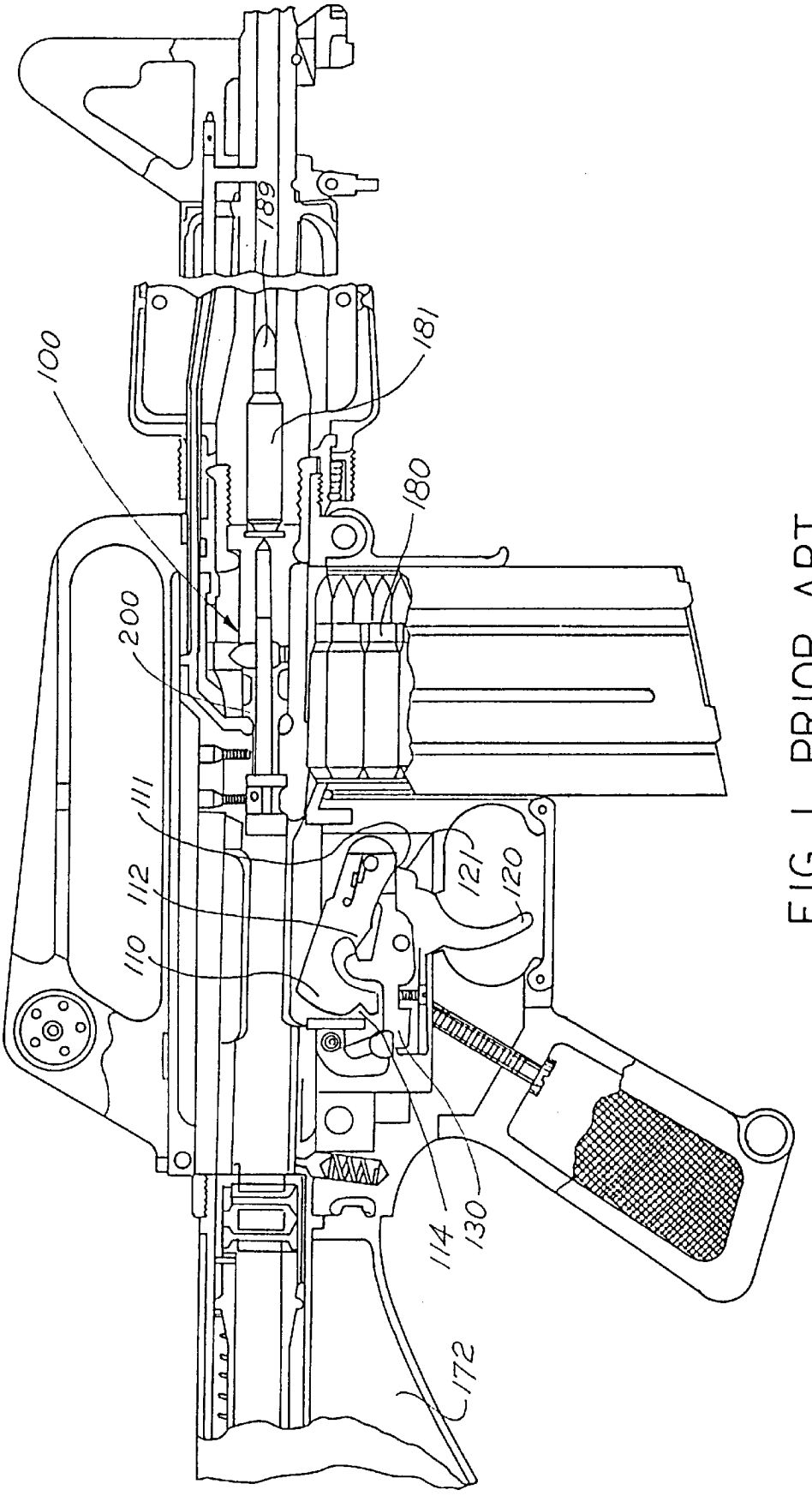


FIG. 1 PRIOR ART

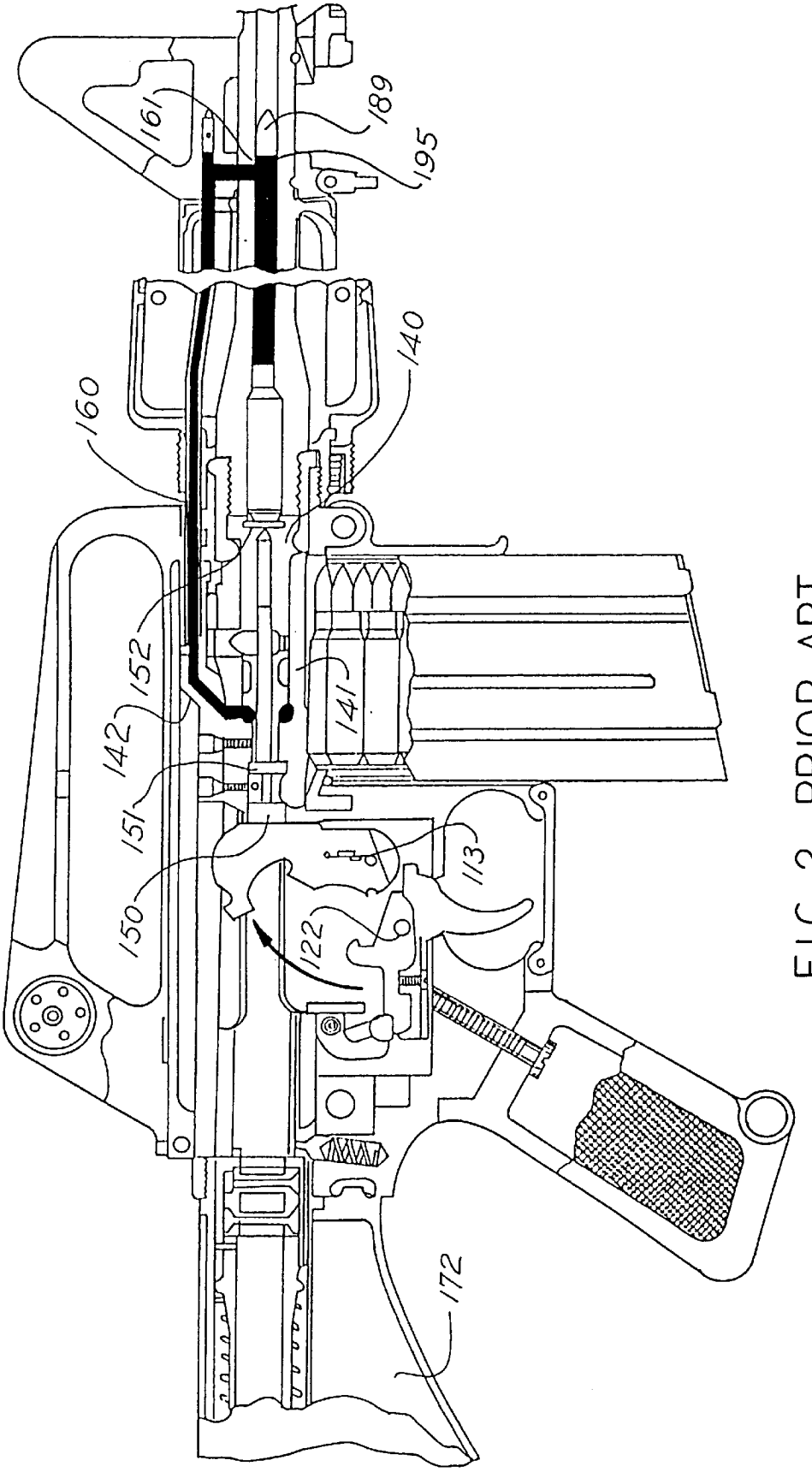


FIG. 2 PRIOR ART

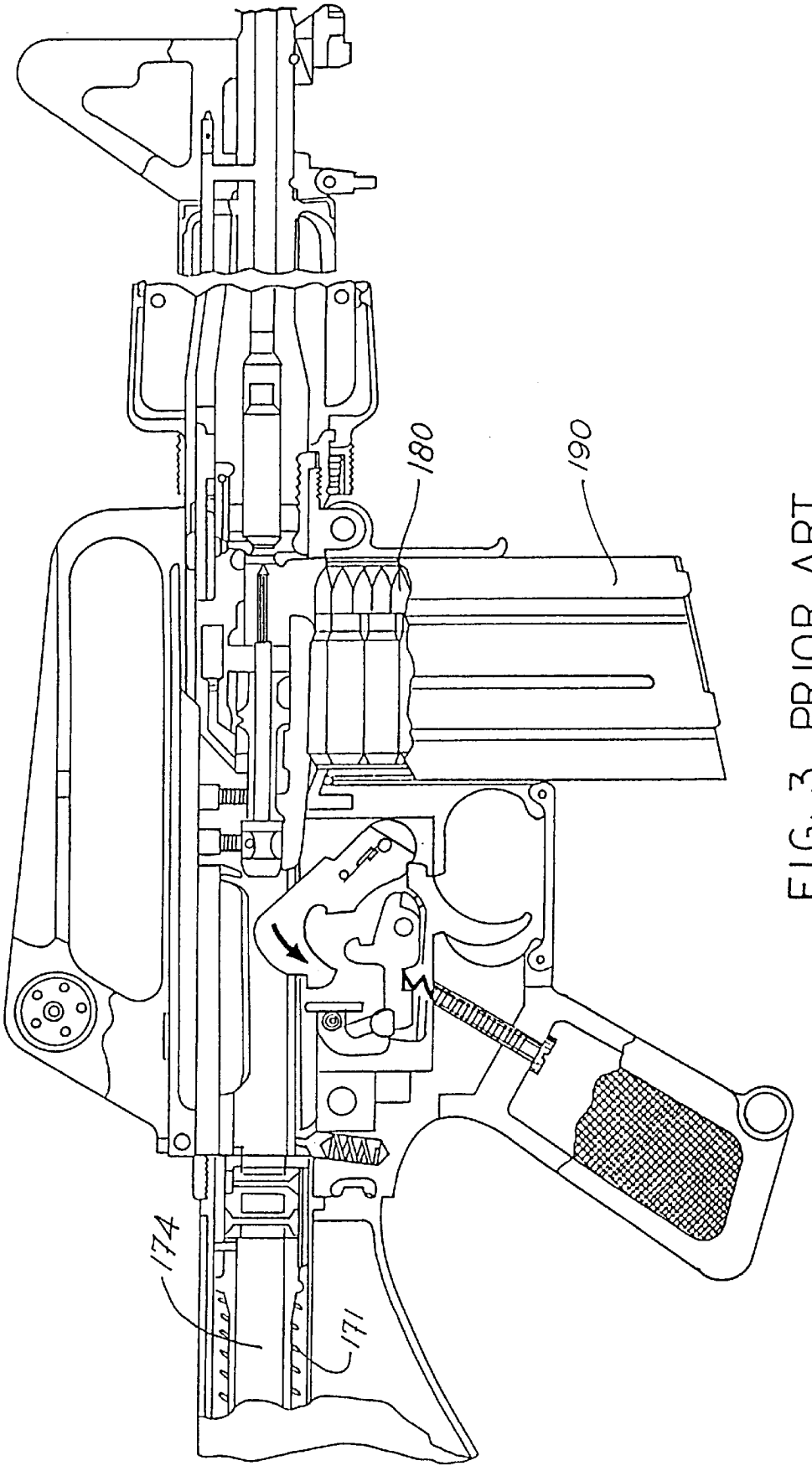
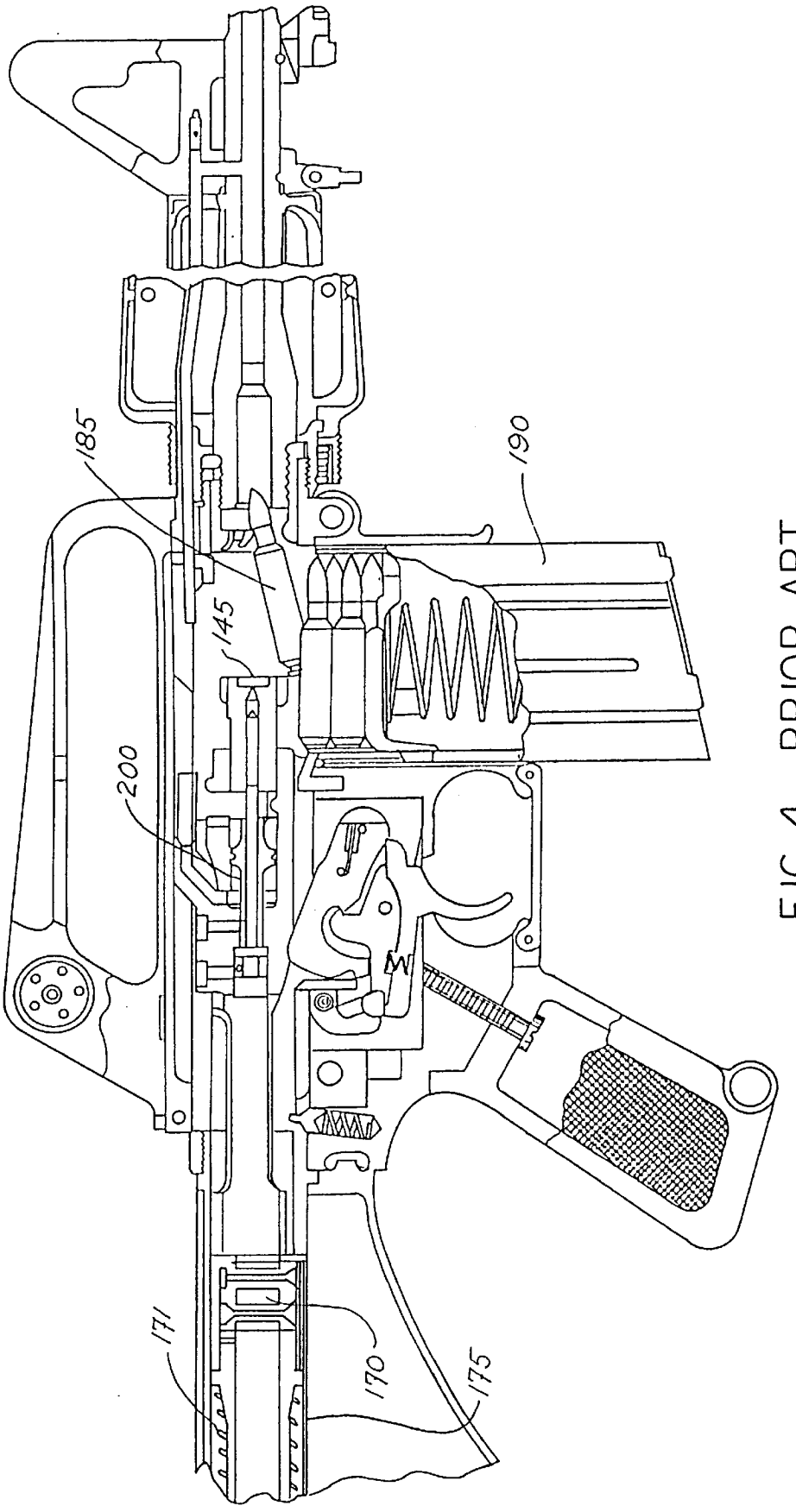


FIG. 3 PRIOR ART



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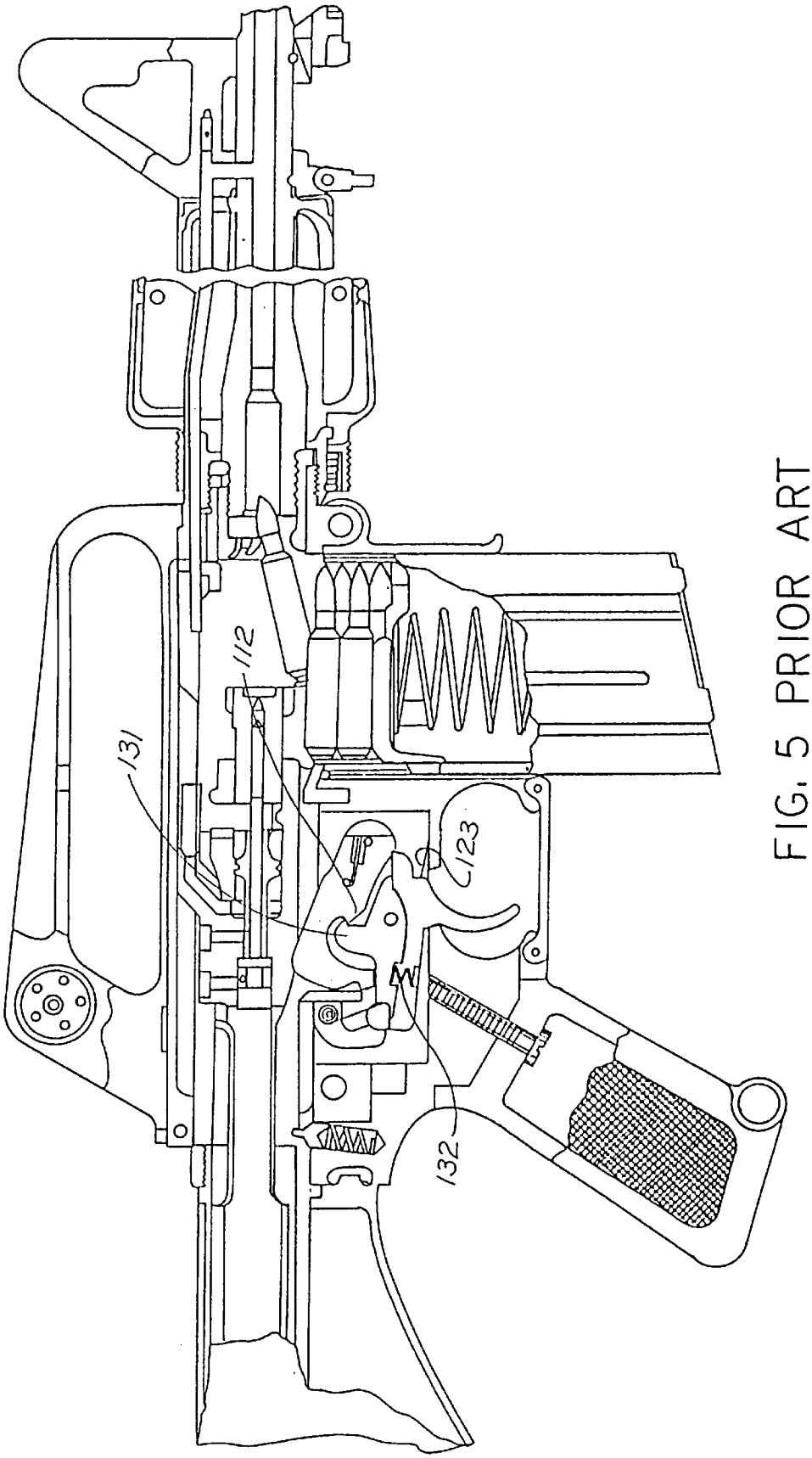

FIG. 5 PRIOR ART

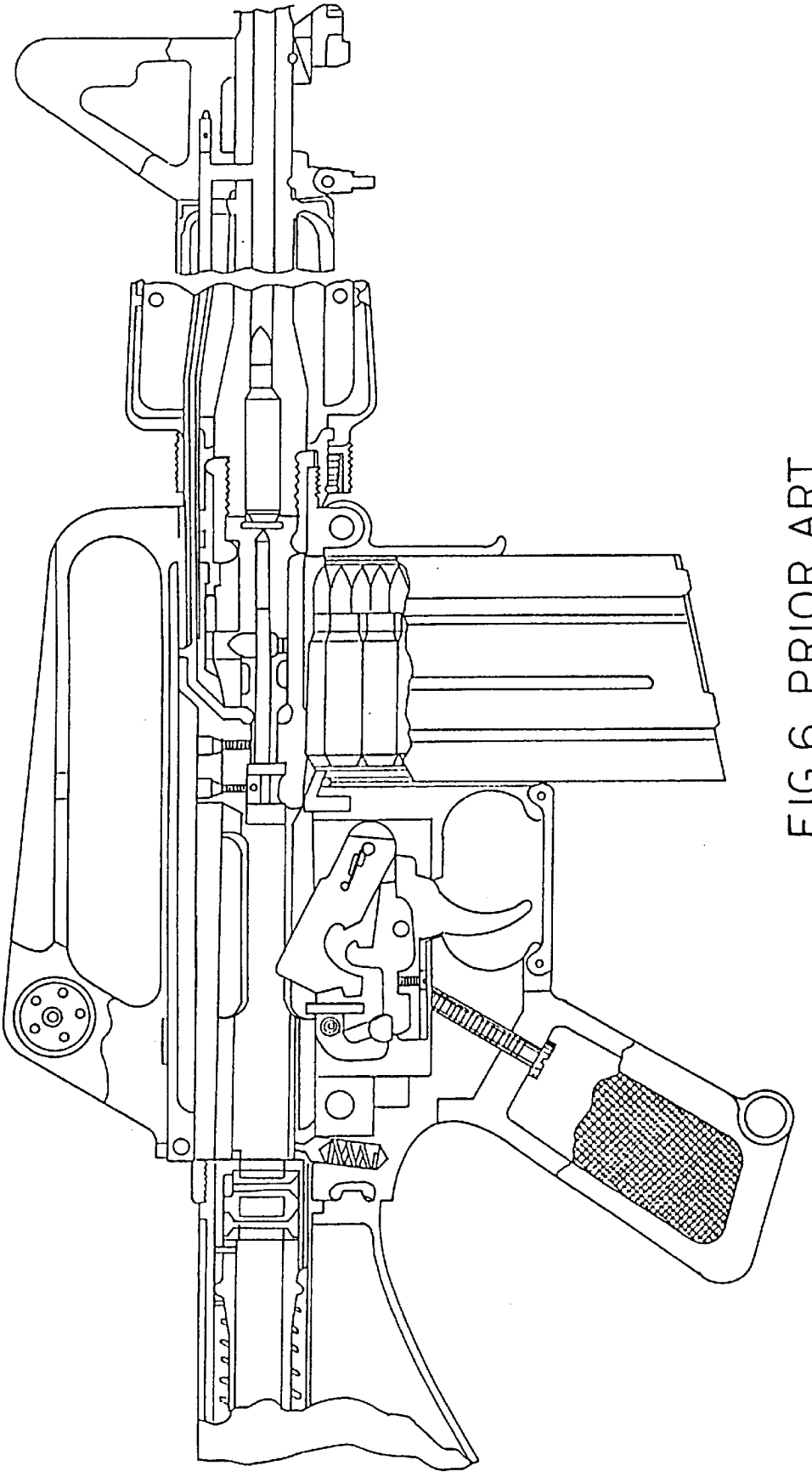

FIG.6 PRIOR ART

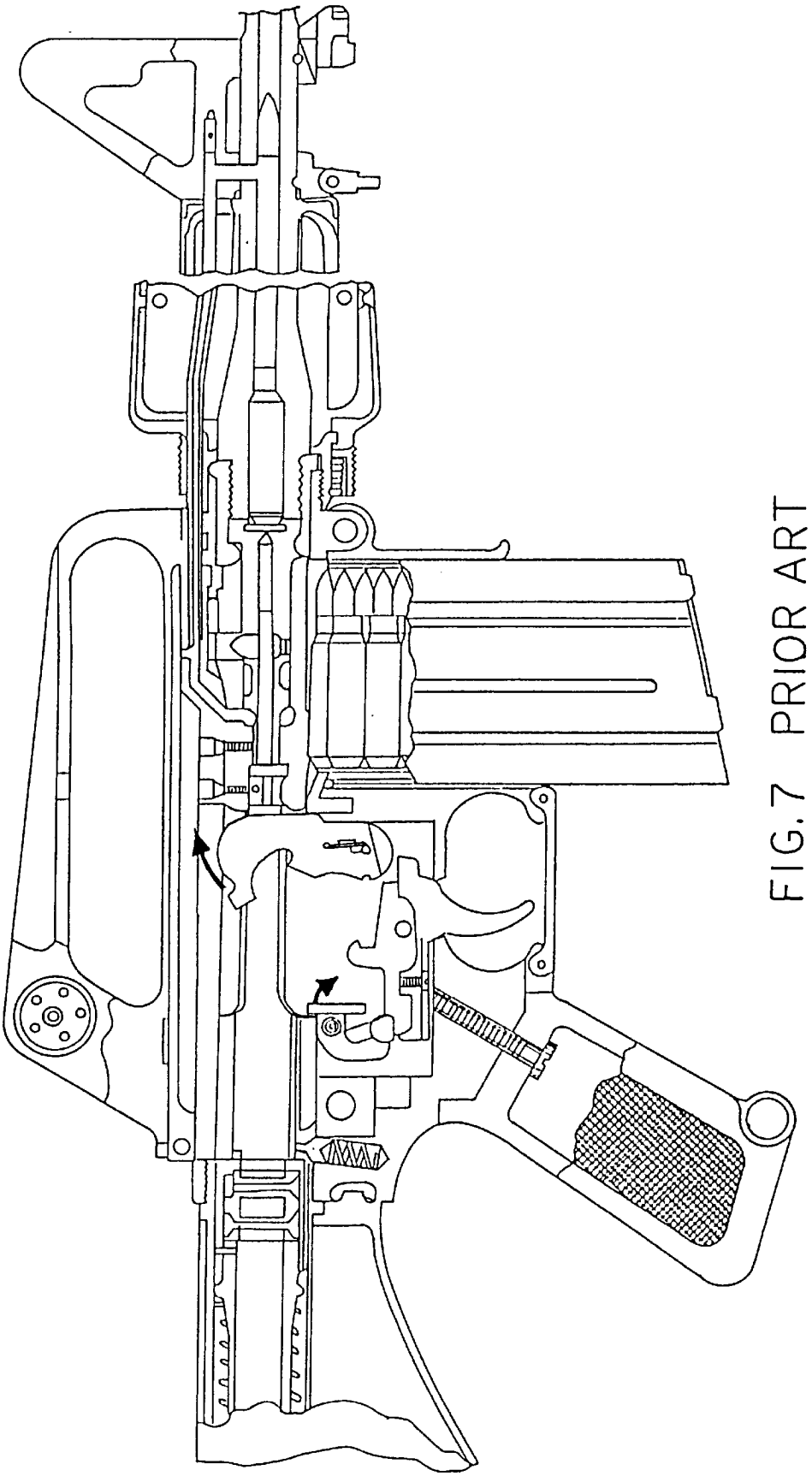

FIG. 7 PRIOR ART

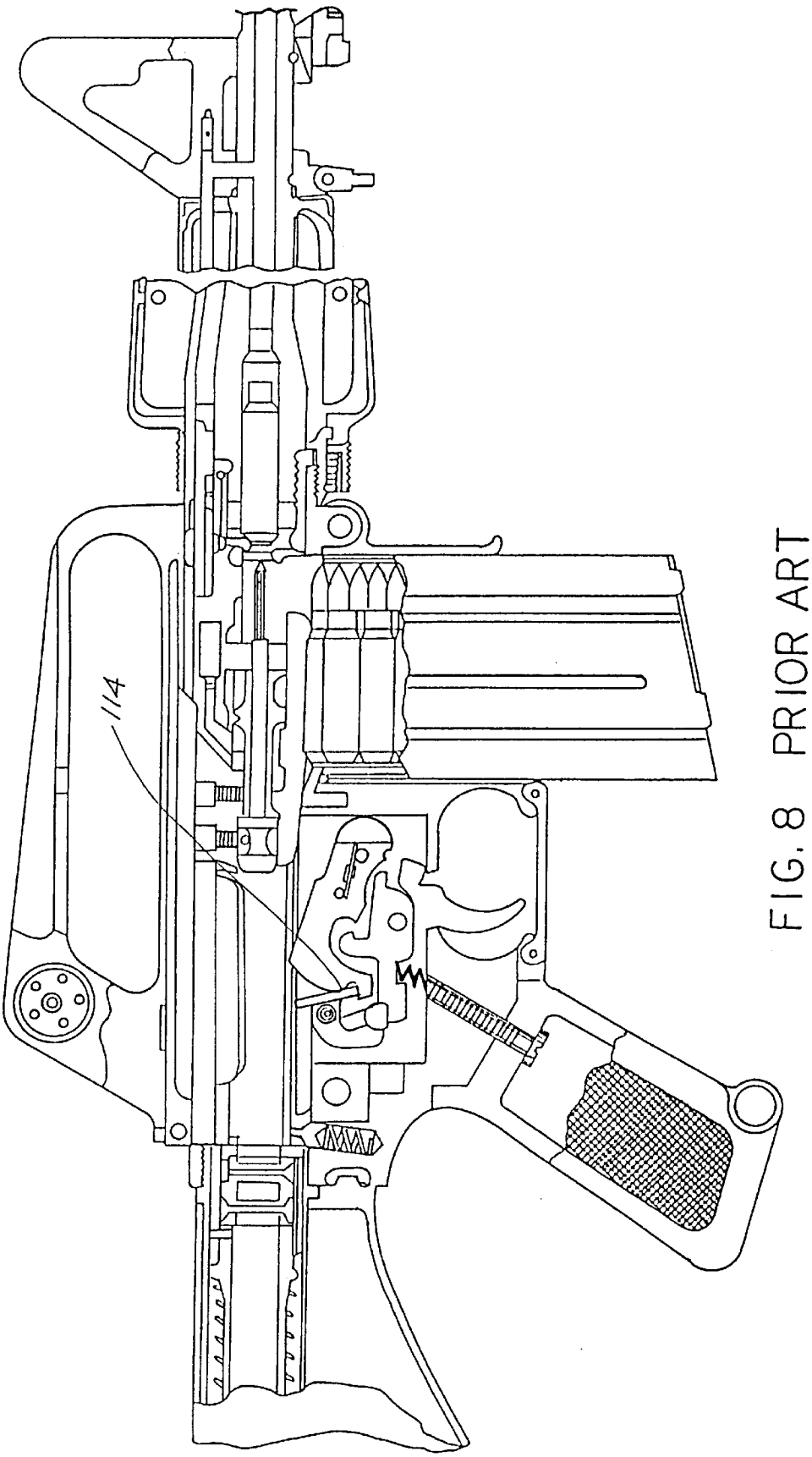

FIG. 8 PRIOR ART

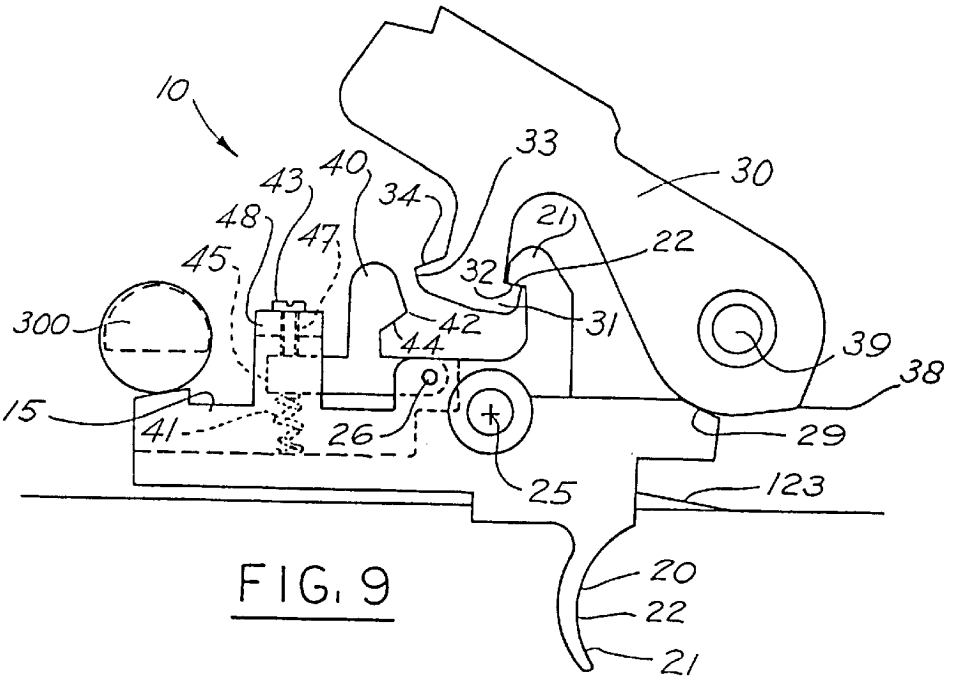

FIG. 9

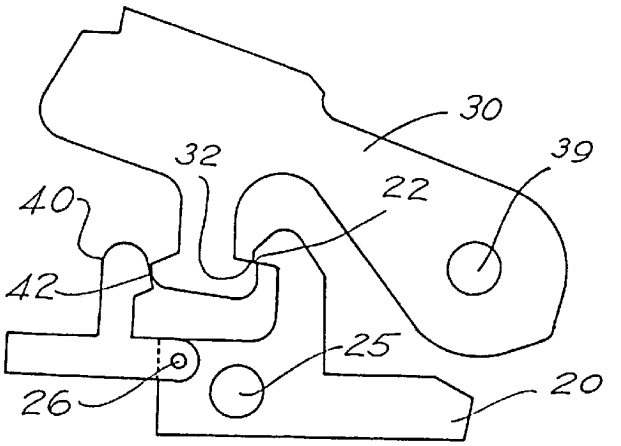

FIG. 10

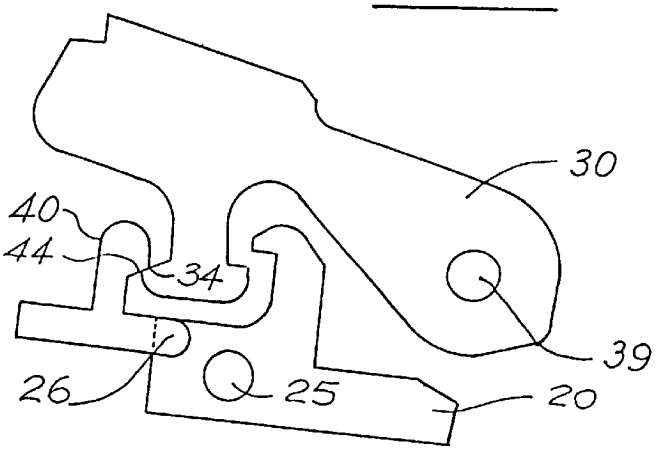

FIG. 11

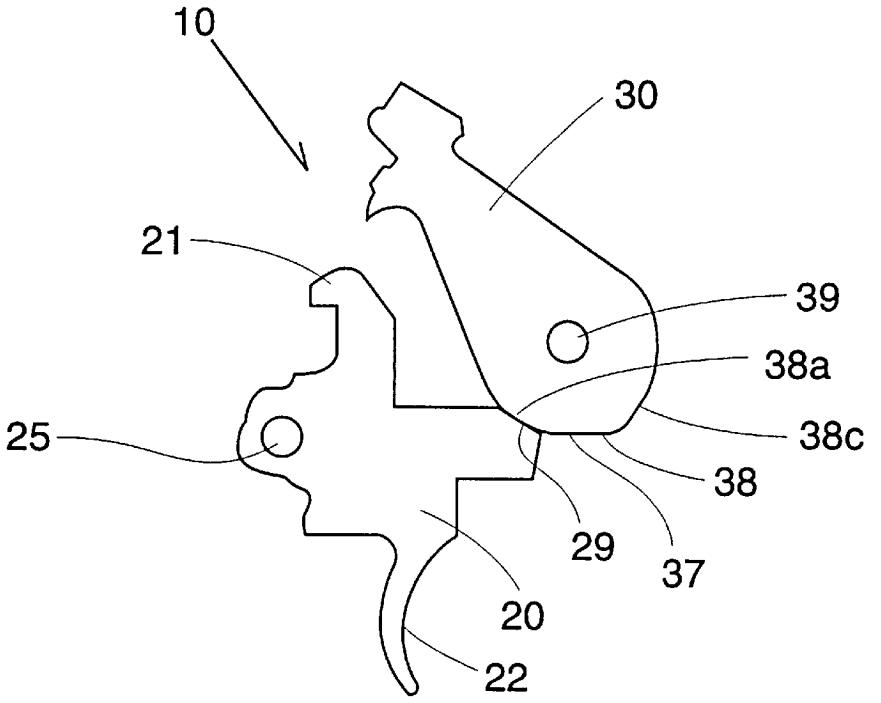
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FIG. 12

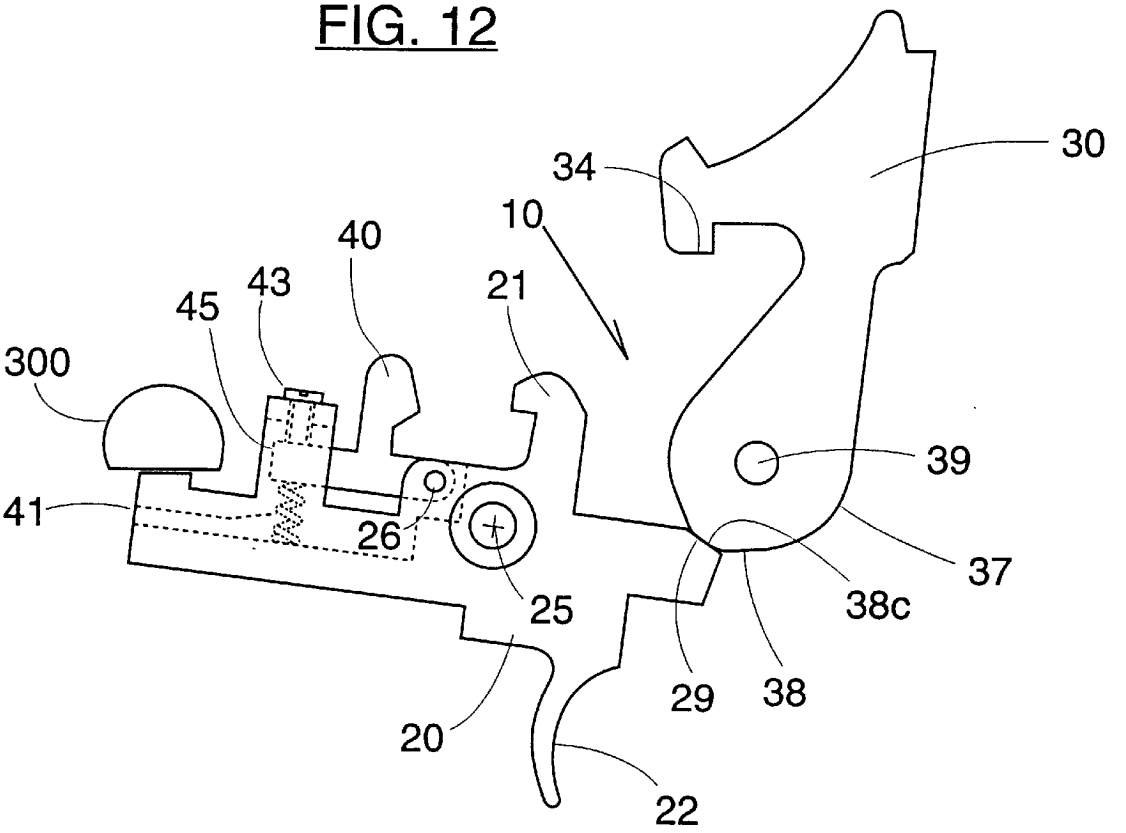
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FIG. 13

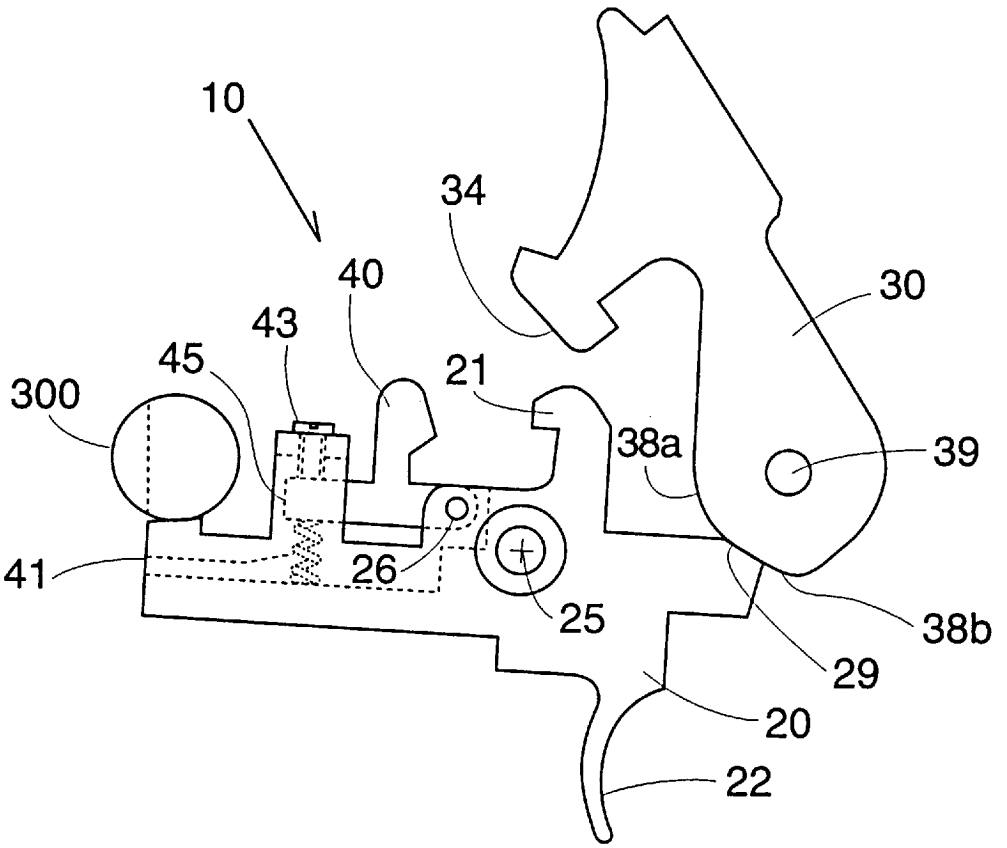

FIG. 14

MULTI-STAGE MATCH TRIGGER ASSEMBLY FOR USE WITH SEMI-AUTOMATIC WEAPONS

This application is a continuation-in-part application of U.S. patent application Ser. No. 08/299,854 now U.S. Pat. No. 5,501,134.

BACKGROUND OF THE INVENTION

The present invention relates generally to the field of trigger systems for semi-automatic weapons and specifically to the use of a trigger assembly on AR-15 type rifles; The AR-15 rifle is the civilian version of the military M-16 rifle and is sometimes referred to as the Mouse Gun.

The trigger assembly of the present invention is designed to help improve the accuracy and precision of the individual shooting a firearm by increasing the control that the individual (a shooter) has over trigger operation and thereby control over the discharge of the firearm. Control of the trigger operation is especially important in match shooting tournaments where the goal is to have better accuracy and precision than the other contestants. Total control over the operation of the trigger assembly, and thus the discharge of the firearm, is crucial.

Ideally the shooter wants to be able to discharge his or her firearm by exerting as little force as possible on the trigger so that there is minimal perceptible movement of the trigger. The more force and perceived motion required to pull or actuate the trigger, the harder it is to accurately hit the target since it is harder for the shooter to exactly determine when the firearm will discharge and also, since, a hard pull on the trigger tends to jar the whole firearm and thus affect the accuracy of the shooter.

In order to achieve this goal shooters desire to reduce the perceptible movement of the trigger to an absolute minimum point at which the gun will fire. Most shooters say they want a feel to the final pull of the trigger before firing that is similar to the breaking of a glass rod so that there is a crisp release as the firearm is discharged.

A smooth, almost effortless, pull of the trigger is desired since this will minimize any jarring of the firearm and makes it easy to determine the precise moment the firearm will discharge. In order to do this many match shooters will modify their trigger mechanisms to ensure that the mechanism is at absolute minimum engagement with the hammer of the firearm. This makes discharge of the firearm very easy. Unfortunately, this leads to a safety problem.

When the trigger mechanism has minimal engagement with the hammer it means that the firearm will readily discharge. Even the actions of carrying the firearm, of jarring the firearm, or the cycling action of the firearm after discharge could cause an unwanted discharge or an additional subsequent discharge. This, to put it mildly, is highly undesirable and creates a danger of serious injury or loss of life.

The present invention greatly reduces the probability of accidental firearm discharge while at the same time providing the firearm with desired trigger action characteristics. Shot to shot consistency of pull weight and travel is insured without abnormal manipulation or motion between shots. Also, the present invention makes the structure of the receiver of a semi-automatic weapon sufficiently different from the automatic weapons upon which the semi-automatic firearm is based so that it is much more difficult to convert the semi-automatic firearm to an automatic firearm.

While it is impossible to absolutely prevent a determined individual from illegally converting a semi-automatic firearm to an automatic firearm, the present invention makes it necessary for the person attempting the conversion to have a much greater level of skill to accomplish that conversion than is currently necessary.

The inventor knows of no prior art that discloses the unique and simple design of the present invention.

SUMMARY OF THE INVENTION

The invention may generally be described as a multi-stage trigger assembly for use by a shooter of a firearm; generally an AR-15 or M-16 although the invention could be used in other types of firearms and such use is contemplated by the inventor.

The multi-stage trigger assembly of the present invention comprises essentially a a trigger, a disconnector, a disconnector spring, and a hammer. The trigger is pivotally connected to the firearm and is typically spring loaded or tensioned in a known manner by a trigger return spring, as are the triggers of other firearms, so that the trigger is held in a predetermined position until it is pulled. The trigger spring thus establishes the initial amount of pull necessary to move the trigger and returns the trigger back to its normal position once the firearm has been discharged and the shooter has released the trigger. The trigger also has a pulling surface for allowing the shooter to pull or apply pressure to the trigger and thus actuate the mechanism of the present invention. The trigger and the hammer each include a respective engagement means for engaging each other so that the hammer is held in a cocked position by the trigger before the trigger is pulled. The hammer is also pivotally connected to the firearm and is spring actuated to strike the firing pin once it is released from its engagement with the trigger. It is the pulling of the trigger that releases the hammer.

The disconnector is spring loaded by the disconnector spring and pivotally connected to the trigger. This is so that the disconnector may interact with the hammer, which further includes a contact means for contacting the disconnector so that when the trigger is first pulled (the first stage) the contact means perceptibly contacts a cam like surface on the disconnector at a predetermined time where minimal engagement between the engagement means of the hammer and trigger is reached. The disconnector spring increases the pressure required to pull the trigger completely and disengage the engagement means of the hammer and the trigger (the second stage). This stop, or noticeable contact indicates to the shooter that the limited minimal engagement of the second stage has been reached.

Once the shooter feels the resistance or contact of the contact means contacting the disconnector he or she then knows that only slight additional pressure will be required to discharge the firearm. Accordingly, the shooter knows exactly when the firearm will discharge and thus can exert greater control over the accuracy of his or her shot and the precision with which that shot is made.

Releasing the trigger from its second stage engagement point will allow the trigger to return to its first stage engagement with no additional needed manipulation.

After the shooter discharges the firearm by releasing the hammer, the hammer strikes the firing pin of the firearm and is recocked by the known mechanism of the firearm in the normal manner except that the disconnector of the present invention will also have an engagement means for engaging an additional engagement surface on the hammer when the trigger is still depressed after a round has been discharged. This prevents accidental double discharge of the firearm.

The firearm cannot then be fired again until the shooter releases the trigger. The release of the trigger by the shooter, after a round has been discharged, causes the engagement means of the disconnector to disengage and the engagement means between the trigger and the hammer to re-engage so that the two stage process may again be repeated. The process of engagement, disengagement, and reengagement occurs very quickly and does not slow down or interfere with the shooters ability to shoot but it does prevent accidental double discharge and increases the precision and accuracy of the shooter.

Also, the disconnector of the present invention may be modified so that in addition to being pivotally connected to the trigger and spring loaded it also has an adjustment means that allows the position of the disconnector, relative to its point of contact with the hammer of the firearm at the second stage of the firing process, be adjusted so that a point of absolute minimal engagement between the trigger and the hammer can reached. This fine adjustment feature allows the shooter to tailor the trigger action of the firearm to his or her individual needs and tastes.

Finally, the hammer of the present invention may be modified to have an additional engagement means so that after the trigger has been pulled and the firearm discharged the hammer will engage an engagement means on the disconnector and be held in place until the shooter releases the trigger and the firing sequence can be repeated.

The present invention further includes a trigger locking mechanism. Without the trigger locking mechanism and in the event that either the hammer hook or trigger hook were to break, a loaded firearm may unintentionally discharge. By incorporating the trigger locking mechanism and when the firearm safety is engaged, the trigger cannot move a sufficient distance to permit the hammer to release even if the trigger hook or hammer hook were to break.

The trigger locking mechanism includes a trigger return blocking cam having a cam surface and cam portions located on the hammer and a limit pad incorporated into the trigger. Alternatively, the limit pad could comprise a separate component or be integral to another component such as the disconnector. The cam portions include a root diameter or base circle, a ramp or transition surface, and a cam lobe.

When the safety is engaged, the cam surface remains in substantial contact with the trigger limit pad. If one of the hooks were to break, the hammer would be released and rotate under spring force about the hammer pin. As the hammer and trigger return blocking cam rotate, the cam rotates from a position where its root diameter is in contact with the limit pad to a position where its transition surface is in contact with the limit pad. As the transition surface progresses toward the cam lobe, the hammer will bind against the trigger and the firearm will not discharge.

Next, the locking mechanism design prevents the firearm user from engaging the safety after the firearm has been discharged. When discharged, the firearm must be in the "safety off" position. After firing the firearm, a user may attempt to immediately reengage the safety. Without the present locking mechanism, the safety could be engaged after the firearm has been discharged but before the firearm has been cocked. Persistently trying to cock the hammer while the safety is engaged could break or damage the hammer and/or trigger hooks. By locking the safety into the "safety-on" position after the firearm has been discharged, the above noted situation is prevented. The user must first cock the firearm before engaging the safety thus preventing the possibility of damaging the hooks.

Finally, the locking mechanism can be used as a temporary disabling mechanism. After the firearm is unloaded, the operator opens the firearm. The hammer is next released while under control permitting it to move to approximately the half way point. The operator next engages the safety and closes the firearm. In this condition, the firearm appears to be in the conventional "safety-on" condition. The safety is engaged and the trigger will not move. Disengaging the safety will allow the hammer to move to the fire position which will again lock the trigger and the safety and neither of them will move.

These and other benefits of the present invention will be apparent to one skilled in the art from the following description.

DESCRIPTION OF THE DRAWINGS

FIGS. **1–8** are cutaway side views of the prior art trigger assembly of an AR-15/M-16 firearm.

FIG. **1** shows a cutaway side view of the prior art firearm with the hammer in the cocked position.

FIG. **2** shows a cutaway side view of the prior art firearm showing the hammer being released by the trigger and striking the firing pin.

FIG. **3** shows a cutaway side view of the prior art firearm with the bolt starting to move backwards and the hammer moving back toward the cocked position.

FIG. **4** shows a cutaway side view of the prior art firearm with the bolt back and the hammer returned to the cocked position and a new cartridge being placed into the chamber.

FIG. **5** shows a cutaway side view of the prior art firearm with the bolt starting to move forward.

FIG. **6** shows a cutaway side view of the prior art firearm with the bolt back in position and the trigger released.

FIG. **7** is a cutaway side view of the prior art firearm showing the relative movement of the hammer to the trigger.

FIG. **8** is a cutaway side view of the prior art firearm showing the firearm set to full automatic.

FIGS. **9–11** show the two stage trigger assembly of the present invention.

FIG. **9** is a side plan view of the firing mechanism of the present invention showing the engagement of the trigger and the hammer at the first firing stage.

FIG. **10** is a side plan view of the firing mechanism of the present invention showing the engagement of the trigger and the hammer at the second firing stage.

FIG. **11** is a side plan view of the firing mechanism of the present invention showing the engagement of the hammer and the disconnector after a round has been fired.

FIG. **12** is a partial side plan view of the firing mechanism of the present invention showing the engagement of the trigger return blocking cam and the trigger limit pad when the firearm is in a cocked position.

FIG. **13** is a side plan view of the firing mechanism of the present invention showing the engagement of the trigger return blocking cam and the trigger limit pad when the firearm is in a discharged position.

FIG. **14** is a side plan view of the firing mechanism of the present invention showing the engagement of the trigger return blocking cam and the trigger limit pad when the firearm is in the temporarily disabled position.

DETAILED DESCRIPTION

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the

physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. While the preferred embodiment has been described, the details may be changed without departing from the invention, which is defined by the claims.

The present invention **10** is specifically designed to work in combination with the civilian version of the M-16 known as the AR-15. However, the present invention could be used with other types of firearms having characteristics similar to the AR-15.

To understand the function and structure of the present invention it is necessary to understand how the AR-15 functions. Referring to FIGS. **1–8** the firing action of the AR-15, set on semi-automatic, may be explained.

As illustrated in FIG. **1–8** the firing mechanism assembly **100** of the AR-15 may be seen to include a hammer **110**, a lower hammer notch **111**, an upper hammer notch **112**, hammer springs **113**, a top outside hammer notch **114**, a trigger **120**, a trigger sear **121**, a trigger pin **122**, a trigger spring **123**, a disconnect mechanism **130**, a disconnect hook **131**, a disconnect spring **132**, a bolt **140**, a bolt carrier **141**, a bolt carrier key **142**, a firing pin **151** having a base **150** and a head **152**, a gas tube **160**, a gas tube port **161**, a buffer assembly **170**, an action spring **171**, a buffer **174**, cartridges **180**, and a spring loaded magazine **190** for holding the cartridges **180**.

As FIGS. **1** and **2** illustrate, the firing process of the AR-15 begins with the hammer notch **111** is engaged with the trigger sear **121**. As the trigger **120** is pulled, the hammer **110** is released and rotates forward, striking the firing pin **151** on its base **150** and firing the chambered cartridge **181** thereby discharging a bullet **189** from the chamber **195**. As the bullet **189** passes the gas port **161**, a portion of the expanding gas that propels the bullet **189** is routed from the chamber **195** through the gas tube **160** and into a cylinder **200** formed between the bolt **140** and the bolt carrier **141**.

Referring to FIG. **3**, the pressure of the gas diverted into the cylinder **200** is sufficient to drive the bolt carrier **141** toward the buffer **174** located in the stock **172** of the AR-15. As this happens the bolt cam pin rotates the bolt **140** and disengages the bolt lugs from the lugs in the barrel extension. The hammer **110** is thereby returned to its cocked position and the action spring **171** is compressed. As the bolt **140** and bolt carrier **141** move rearward, the extractor withdraws the spent cartridge case from the chamber, and the ejector throws it out the ejection port.

Looking at FIG. **4**, the rearward motion of the bolt carrier **141** may be seen to be arrested by the buffer assembly **170** in the action spring guide **175**. The compressed action spring **171** then forces the bolt carrier **141** forward. The face **145** of the bolt **140** picks up the top cartridge **185** from the magazine **190** and thrusts it into the chamber **195**.

Referring to FIGS. **5–8**, as the bolt lugs enter the barrel extension, the ejector is depressed against the cartridge case and the extractor snaps into the extracting groove. During the final half inch of the closing stroke, the bolt cam pin moves out of the receiver guide and rotates the bolt **140** to the locked position. The upper hammer notch **112** is held by the hook **131** of the disconnect **130**. When the trigger **120** is released, the trigger spring **123** causes the trigger **120** to return to its normal position, carrying the disconnect **130** backward, releasing the hammer **110**, which drops from the disconnect **130** to the cocked position on the trigger sear **121**.

The present invention **10** eliminates the single stage trigger structure of the AR-15 and replaces it with a two stage structure that is mounted in the receiver **15** of the AR-15; shown in FIGS. **9–11**.

The present invention **10** may be seen to comprise a trigger **20**, a trigger hook **21**, a hammer **30**, a hammer hook **31** integral to the hammer **30**, and a adjustable disconnector **40** having a disconnector spring **41** and an adjustment screw **43**.

The trigger hook **21** has an engagement surface **22**. The hammer hook **31** has an engagement surface **32**. In the first stage before pulling the trigger **20** it is desirable to make the contact area between these two surfaces (**21** and **32**) as large as possible. This prevents accidental discharge of the firearm **11**. The trigger hook **21** and the disconnector **40** are directly connected to the trigger **20** so that the trigger hook **21**, the disconnector **40**, and the trigger **20** pivot about pivot pin **25**.

The disconnector **40** has a disconnector cam surface **42** and the hammer **30** has a hammer cam surface **33**. Referring to FIG. **10**, as the trigger **20** is pulled the trigger hook **21**, the disconnector **40**, and the trigger **20** pivot about pivot pin **25** so that the hammer cam surface **33** contacts the disconnector cam surface **42** and the contact area between engagement surface **22** and engagement surface **32** is reduced to the minimum necessary to prevent the hammer hook **31** from being released. This is the movement from the first stage to the second stage of the two stage trigger assembly of the present invention **10**.

The contact of the disconnector cam surface **42** and the hammer cam surface **33** provides an increase in the resistance to the pull of the trigger **20**. Typically, a firearm will have a certain predetermined amount of pull weight required to actuate the trigger mechanism and discharges the firearm. In the present invention **10** this pull weight is about 3 to 4 pounds of total force; 1 to 2 pounds in the initial or first stage and 1 to 2 additional pounds in the final or second stage. The amount of pull weight may, of course, be adjusted using different springs or adjusting the tension of the springs already in the firearm.

Prior to firing a shooter will want to feel a distinct and discernable contact or stop in the movement of the trigger. This contact is the limiting factor for second stage. This perceived stop acts to inform the shooter that only a slight augmentation of the pressure being applied to the trigger will now produce the crisp action that will immediately result in discharge of the firearm. The shooter may then apply that pressure and immediately discharge the firearm in a precise and accurate manner.

Accordingly, in order that this type of feel be achieved the contact area between the engagement surfaces **22** and **32** in the first stage may be kept at a maximum. As the trigger is pulled and the stop point is reached do to contact between the hammer cam surface **33** and the disconnector cam surface **42**, the contact area between the engagement surfaces **22** and **32** is reduced to a minimum; typically about 0.005 inches.

The shooter feeling this clearly discernable stop may then accurately and safely pull the trigger **20** to completion. The hammer **30** then contacts the rest of the firing mechanism of the AR-15 as previously described except that if the trigger **20** two stage trigger mechanism of the present invention **10** is kept compressed the hammer hook **34** will engage the disconnector hook **44** thereby preventing an accidental or double discharge of the firearm.

This engagement of the hammer hook **34** and the disconnector hook **44** after discharge of the firearm is made possible by the structure of the disconnector **40**.

Still referring to FIGS. **9–11** and in particular FIG. **9**, the disconnector **40** may be seen to be a separate structure from

the trigger **20**. It is connected to the trigger **20** by and at pivot pin **26**. The disconnector **40** further includes the adjustment screw **43** and the spring **41**. Located between the screw **43** and the spring **41** is the adjustment arm **45** of the disconnector **40**.

The spring **41** is located between the adjustment arm **45** and the body of the receiver **15**. The screw **43** is mounted, through a threaded opening **47** in a block **48** mounted to the receiver **15**, above the adjustment arm **45**. Turning the screw **43** so that it moves downward against the adjustment arm **45** will move the adjustment arm **45** downward so that the spring **41** is compressed. Loosening the screw **43** will cause the screw **43** to move away from the adjustment arm **45** and the compressed spring **41** will move the adjustment arm **45** upward.

Consequently, as illustrated by FIGS. **9–11**, the movement of the adjustment arm **45** affects the position of the disconnector cam surface **42** so that the point of contact between the disconnector cam surface **42** and the hammer cam surface **33** can be fine tuned for maximum effect and reliability. Once the relationship between the disconnector cam surface **42** and the hammer cam surface **33** is made no further adjustment of the adjustment arm **45** is necessary nor should it be necessary; other than to compensate for the normal wear of the parts over time.

Please note that while the relationship between the disconnector cam surface **42** and the hammer cam surface **33** may be finely adjusted by using the screw **43** to move the adjustment arm **45** no adjustment means is necessary and that all points of engagement and contact within the present invention **10** could be pre-set at the manufacturer. The adjustment means is an option to provide greater versatility and ease of use but it is not a necessity. Finally, the hammer hook **34** and the disconnector hook **44** will engage with each other immediately after the trigger **20** has been pulled and the firearm discharged. This prevents the hammer **30** from being able to rotate back up and stride the firing pin **151** again after discharge while the trigger **20** is still totally depressed or pulled. This prevents the inadvertent automatic or double discharge firing of the firearm.

The hammer **30** is locked in position and another bullet **189** cannot be discharged from the firearm until the trigger **20** has been released so that the firing process may be repeated.

Finally, the present invention **10** may also include a trigger return blocking cam **38** on the hammer **30** and a trigger limit pad **29** on the trigger **20** as shown in FIG. **9–11**. This eliminates the notch **111**. The trigger return blocking cam **38** and the trigger limit pad **29** eliminate the possibility of engagement of the safety **300** when the hammer **30** is in the fired position. This prevents the possibility of damaging the mechanism of the present invention **10**.

The trigger locking mechanism comprises a trigger return blocking cam **38** and a trigger limit pad **29**. As shown in FIGS. **12–14**, trigger return blocking cam **38** is located on and integral to one end of the hammer **30**. The cam **38** includes a cam surface **37** about its periphery and three cam surface portions. The portions include a root diameter or base circle **38***a*, a ramp or transition surface **38***b*, and a cam lobe **38***c*. The cam profile begins at the root diameter **38***a*, continues onto the transition surface **38***b* and crests at the cam lobe **38***c*. As shown in FIGS. **12–14** and in the preferred embodiment, trigger limit pad **29** is located on and integral to the front end of the trigger **20**. In an alternative embodiment, the trigger limit pad **29** could be a separate component or could be integral to another trigger assembly component such as the disconnector.

The combination of the trigger return blocking cam **38**, trigger limit pad **29** and known firearm safety mechanism **300** comprises a redundant safety mechanism. When safety **300** is engaged (i.e. in the "safety on" position), the trigger **20** cannot sufficiently move to permit hammer **30** to release. However, if trigger hook **21** or hammer hook **34** were to break, hammer **30** would release. If loaded, the firearm could discharge. By incorporating the trigger return blocking cam **38** and trigger limit pad **29** into trigger assembly **10**, the firearm would not discharge even if one of the hooks **21** or **34** were to break.

The trigger assembly **10** is shown in the cocked position in FIG. **12**. In this position, a first portion or root diameter **38***a* of trigger return blocking cam **38** contacts trigger limit pad **29**. As indicated above, adjacent to root diameter **38***a* is transition surface **38***b* followed by cam lobe **38***c*. If either the trigger hook **21** or hammer hook **34** were to fail, the hammer would begin to rotate about pin **39**. Provided the firearm safety **300** is engaged (i.e. in the "safety on" position), the subsequent contact of the limit pad **29** with transition surface **38***b* and cam lobe **38***c* will prevent the hammer **30** from rotating about pin **39** to the point of striking the firing pin. The hammer rotation will be stopped before reaching the firing pin regardless of whether the trigger hook **21** and hammer hook **34** are engaged or not.

In order to be discharged or fired, the firearm safety **300** must be in the "safety off" position. When fired, the hammer **30** rotates to the discharged position shown in FIG. **13**. In this position and as shown in FIG. **13**, the third portion or cam lobe **38***c* of trigger return blocking cam **38** contacts trigger limit pad **29**. The contact between and relationship of limit pad **29** and cam lobe **38***c* prevents the operator from engaging the safety **300**. With the trigger locking mechanism, including the engagement of cam portion **38***c* with trigger limit pad **29**, the safety **300** cannot be engaged. Without the locking mechanism, the safety **300** could be engaged when the hammer **30** is in the discharged position. If the operator next attempted to cock the firearm (i.e. attempted to cock the firearm with the safety set to the "safety on" position), damage to either the hammer hook **34** or trigger hook **21** may occur as trigger hook **21** would be locked in position by the safety **300** and thus hammer hook **34** could not pass by and beneath the trigger hook **21** into the cocked position. Repeated attempts by the operator would likely to damage one or both hooks. To prevent damage to the hooks **21** and **34**, the safety **300** cannot be engaged until the firearm has been cocked.

Now referring to FIG. **14**, the trigger assembly **10** is shown in a locked or temporarily disabled position. The firearm must be unloaded before engaging the trigger assembly **10** in the temporarily disabled position. In this position, second portion or transition surface **38***b* of trigger return blocking cam **38** is engaged with trigger limit pad **29** in order to lock the hammer in a substantially intermediate hammer position. This position is achieved by releasing the hammer **30** under control and allowing it to move to approximately the half way point. The operator then moves safety **300** to the engaged position as shown in FIG. **14** and closes the firearm. In this condition, the firearm cannot be fired, cycled, or cocked. To an observer of the firearm, the fire arm appears to be in the "safety-on" position. The safety **300** is engaged and the trigger **20** will not move. Disengaging the safety **300** will allow the hammer to move to the fired position which will again lock the trigger **20** and the safety **300** and neither of them will move. The firearm must be loaded and the hammer **30** must be cocked before the firearm can be discharged.

The foregoing is considered as illustrative only of the principles of the invention. Furthermore, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described.

What is claimed is:

1. A trigger lock for a firearm having a hammer including a hammer hook, a trigger including a trigger hook and an engagable safety mechanism, the hammer hook and trigger hook being engagable when the firearm is in a cocked position, the trigger lock comprising:

a trigger return blocking cam integral to the hammer, the trigger return blocking cam having a profile and three predetermined cam portions;

a trigger limit pad integral to the trigger;

the first predetermined cam portion being a root diameter;

the second predetermined cam portion being a transitional surface;

the third predetermined cam portion being a cam lobe;

the trigger limit pad contacting one of the trigger return blocking cam portions;

the safety mechanism being engagable with the trigger;

whereby substantial contact of the limit pad with the cam lobe prevents the engagement of the safety mechanism after the trigger hook and hammer hook have been disengaged and the firearm has been discharged.

2. The trigger lock for a firearm of claim 1 further comprising the cam profile having an uninterrupted continuous peripheral path from the first portion to the second portion to the third portion.

3. The trigger lock for a firearm of claim 1 wherein the engagement of the trigger hook and hammer hook is separate from the engagement of the trigger return blocking cam and trigger limit pad.

4. A trigger lock for a firearm having a hammer, a trigger, a firing pin and an engagable safety mechanism, the trigger lock comprising:

a trigger return blocking cam integral to the hammer, the trigger return blocking cam having a cam profile and three predetermined portions;

a trigger limit pad integral to the trigger;

the first predetermined cam portion being a root diameter;

the second predetermined cam portion being a transitional surface;

the third predetermined cam portion being a cam lobe;

the trigger limit pad contacting one of the trigger return blocking cam portions;

the safety mechanism being engagable with the trigger;

whereby substantial contact of the limit pad with the transition surface when the safety mechanism is engaged prevents the hammer from striking the firing pin.

5. The trigger lock for a firearm of claim 4 further comprising the cam profile having an uninterrupted continuous peripheral path from the first portion to the second portion to the third portion.

6. The trigger lock for a firearm of claim 4 wherein the trigger return blocking cam integral to the hammer is located at a first hammer end;

the hammer further including a hammer hook located at a mid section;

the trigger including a trigger hook, the hammer hook and trigger hook being engagable; and

the engagement of the trigger hook and hammer hook being separate from the engagement of the trigger return blocking cam and trigger limit pad.

7. A trigger lock for a firearm having a hammer including a hammer hook, a trigger including a trigger hook, a firing pin and an engagable safety mechanism, the trigger lock comprising:

a trigger return blocking cam integral to the hammer, the trigger return blocking cam having a cam profile and three predetermined portions;

a trigger limit pad integral to the trigger;

the trigger return blocking cam having three predetermined portions;

the first predetermined cam portion being a root diameter;

the second predetermined cam portion being a transitional surface;

the third predetermined cam portion being a cam lobe;

the trigger limit pad contacting one of the trigger return blocking cam portions;

the safety mechanism being engagable with the trigger;

whereby substantial contact of the limit pad with the cam lobe prevents the engagement of the safety mechanism after the trigger hook and hammer hook have been disengaged and the firearm has been discharged and;

whereby substantial contact of the limit pad with the transition surface when the safety mechanism is engaged prevents the hammer from striking the firing pin.

8. The trigger lock for a firearm of claim 7 further comprising the cam profile having an uninterrupted continuous peripheral path from the first portion to the second portion to the third portion.

9. The trigger lock for a firearm of claim 7 wherein the hammer hook and trigger hook are engagable and the engagement of the trigger hook and hammer hook is distal from the engagement of the trigger return blocking cam and trigger limit pad.

10. A trigger locking mechanism for a firearm having a trigger including a trigger hook, a hammer having a hammer hook, and an engagable safety mechanism, the hammer being pivotable about a hammer pin, the trigger locking mechanism comprising:

a trigger return blocking cam;

the trigger return blocking cam being formed in an end of the hammer about the hammer pin and separate from the hammer hook;

the trigger return blocking cam having a cam surface about its periphery;

the cam surface including a root diameter, a transition surface and a cam lobe;

a trigger limit pad;

the trigger limit pad being formed in the front end of the trigger forward of the trigger hook;

the trigger limit pad being engagable with the trigger return blocking cam;

the safety mechanism being engagable with the trigger;

whereby the root diameter and trigger limit pad are capable of contact when the firearm is cocked;

whereby substantial contact of the trigger limit pad with the transition surface while the safety mechanism is engaged prevents substantial movement of the hammer; and

whereby substantial contact of the trigger limit pad with the cam lobe prevents the engagement of the safety mechanism.

11. The trigger locking mechanism of claim 10 wherein the cam surface includes a smooth uninterrupted transition surface.

12. The trigger locking mechanism of claim 10 further comprising the cam surface beginning at the root diameter, uninterruptedly continuing onto the transition surface and cresting at the cam lobe.

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